

REMARKS

This is in response to the Official Action of December 28, 2006.

The indication of allowability of claims 24, 25, 28, and 29 is acknowledged with appreciation. Claim 29 is cancelled herein for the purpose of rewriting as new claim 33, and formal allowance thereof is respectfully requested. Newly submitted claims 34-39 correspond to previously presented claims 24-26 and 30-32, except that they now depend upon claim 33. Allowance thereof is respectfully requested for the same reasons as claim 33.

Claim 32 stands rejected as indefinite, it being noted that S<sup>7</sup> cannot be alkyl. This claim has been amended to delete S<sup>7</sup> and S<sup>13</sup>, which are indeed specified as together forming an oxo group "=O" in the independent claim. It is accordingly submitted that this rejection should be withdrawn.

**Request for clarification.** In the Official Action, **Inhoffen et al.**, *Tetrahedron Letters*, 1967, vol. 23, pp. 2185-2187, is cited. However, attached to the action and recorded on the USPTO's "PAIR" system is a copy of **T. Nishiwaki**, *Tetrahedron* 1967, vol. 23, pp. 2181-2187. After investigating this matter<sup>1</sup>, it is believed that the correct citation is:

**Inhoffen et al.**, *Tetrahedron Letters*, 1967, no. 23, pp. 2185-2187

a copy of which is enclosed, and which applicants respectfully request the Examiner formally make of record.

Claims 23, 26, 27, 30 and 31 stand rejected under 35 USC 102(b) as anticipated by **Inhoffen et al.** It is said in the Action that Inhoffen teaches the instant compound of formula X when:

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<sup>1</sup> For many years *Tetrahedron Letters* was published without any volume numbers; papers were cited by year, issue number, and page numbers. In 1967, there were 52 issues. A couple of decades later the publisher began using volume numbers (one volume per year), at which point they went back to the inception of the journal and gave this first set of issues volume 1 (1959/1960), incrementing the volumes for each subsequent year. So 1967 wound up as volume 8. This year (2007) *Tetrahedron Letters* is up to volume 48, and *Tetrahedron* is up to volume 63. Indeed, you will see from the Inhoffen paper itself that there is no volume number listed, only an issue number (No. 23). This is a widespread and unfortunate source of confusion.

S<sup>7</sup> and S<sup>13</sup> together are =O,

S<sup>8</sup> and S<sup>14</sup> are both ethyl

S<sup>1</sup> through S<sup>6</sup> and S<sup>9</sup> through S<sup>12</sup> are H and ethyl;

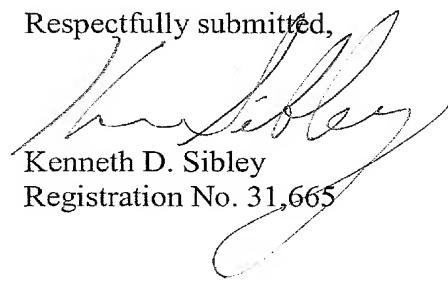
M is present; and

K<sup>1</sup> through K<sup>4</sup> are N.

However, applicants submit that claim 23 requires more: Specifically, applicants respectfully submit that claim 23 further requires that either: (i) S<sup>1</sup> and S<sup>5</sup>; (ii) S<sup>2</sup> and S<sup>6</sup>; (iii) S<sup>10</sup> and S<sup>12</sup>; or (iv) S<sup>9</sup> and S<sup>11</sup>, be *trans*-substituted linking groups Q<sup>1</sup> and Q<sup>2</sup>. It is respectfully submitted that these required features are neither suggested nor disclosed by the cited reference as characterized in the Official Action. Claim 23 has been amended above to better emphasize these feature. Accordingly, it is respectfully submitted that this rejection should be withdrawn, and that claim 23 should be allowed for the same reasons as claims 24 and 25 are indicated allowable.

It is respectfully submitted that this application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,



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Enclosure: Inhoffen et al.

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ZUR WEITEREN KENNTNIS DES CHLOROPHYLLS UND DES HÄMINS XV

UMWANDLUNG DES OCTAÄTHYLPORPHINS IN  
OCTAÄTHYL-GEMINIPORPHYRIN-POLYKETONE

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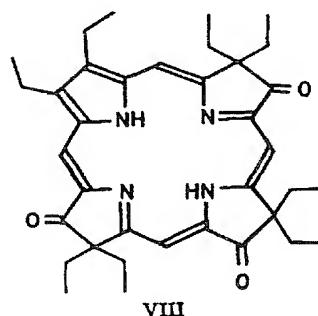
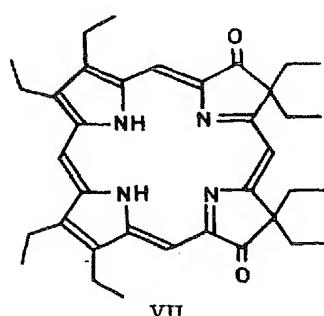
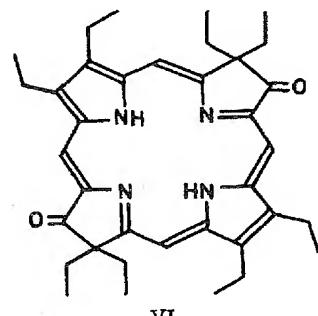
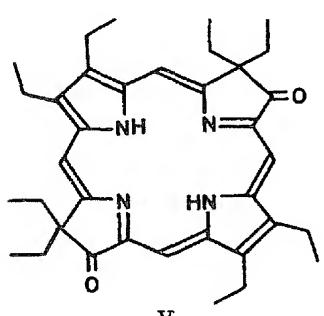
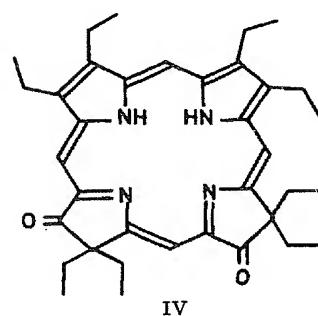
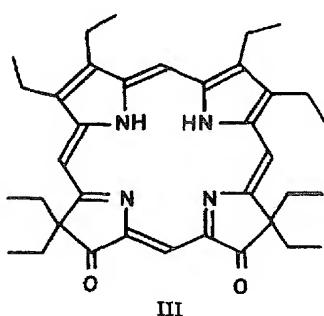
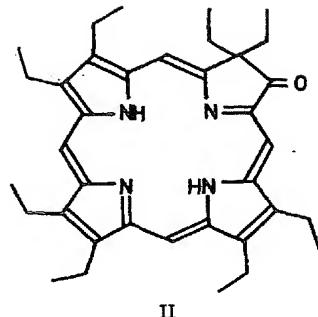
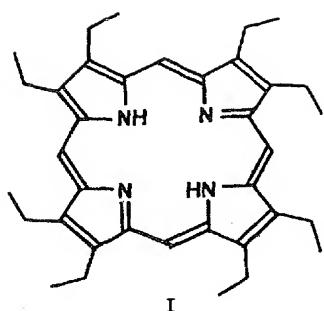
Durch Hydroxylierung von Porphyrinen mit Osmiumtetroxyd konnte H. Fischer Dioxychlorine herstellen, aus denen durch Wasserabspaltung Epoxyde entstehen sollten (1). G. Klotmann klärte diese letztere Reaktion am Beispiel des Octaäthylporphins (I) als Pinakolummlagerung auf und charakterisierte die erhaltene Verbindung als Ketohalbchlorin (2). Dieses Ketohalbchlorin oder, wie wir die neue Verbindungsklasse nennen möchten, das Geminiporphyrin-monoketon (II), lässt sich nach R. Bonnett in eleganter Weise auch durch Oxydation des Porphyrins mit Wasserstoffperoxyd in konzentrierter Schwefelsäure herstellen (3).

Führt man die Reaktion weiter, so wird ein zweiter Pyrrolkern angegriffen, und es entstehen Geminiporphyrin-diketone. Bei symmetrisch substituierten Octaalkylporphinen, in diesem Fall Octaäthylporphin, sind fünf derartige Geminiporphyrin-diketone denkbar (III-VII).

Bei Oxydation mit 5-proz. Wasserstoffperoxydlösung in 85-proz. Schwefelsäure konnten neben II vier Geminiporphyrin-diketone isoliert werden (III-VI), von denen zwei auf Grund ihrer Kernresonanzspektren eindeutig den Strukturen III und IV zugeordnet werden konnten. Für die beiden anderen Isomeren kommen nur die Strukturen V und VI in Frage, jedoch sind deren Spektren so ähnlich, daß eine Unterscheidung allein hierdurch nicht mit Sicherheit möglich war.

Es gelang jedoch, eines der beiden Isomeren durch weitere, analoge Behandlung in ein Geminiporphyrin-triketon zu überführen, dessen Kernresonanzspektrum sich nur mit Struktur VIII vereinen lässt. Die Ausgangssubstanz kann nur VI nicht aber V sein, so daß damit für alle vier erhaltenen Geminiporphyrin-diketone eine eindeutige Zuordnung getroffen werden konnte.

Das theoretisch mögliche fünfte Geminiporphyrin-diketon (VII) entsteht bei dieser Reaktion nicht oder nur in äußerst geringer Menge.



Octaäthyl-geminiporphyrin-diketon III  $C_{36}H_{46}N_4O_2$ , gef. 566Elektronenspektrum (CHCl<sub>3</sub>): 416 m $\mu$ ; 435 m $\mu$ ; 593 m $\mu$ ; 627 m $\mu$ .NMR-Spektrum (CDCl<sub>3</sub>): ms-Protonen bei  $\delta$ : 8,83 8,83 9,59 9,79Octaäthyl-geminiporphyrin-diketon IV  $C_{36}H_{46}N_4O_2$ , gef. 566Elektronenspektrum (CHCl<sub>3</sub>): 404 m $\mu$ ; 420 m $\mu$ ; 440 m $\mu$ ; 538 m $\mu$ ; 579 m $\mu$ ; 594 m $\mu$ .NMR-Spektrum (CDCl<sub>3</sub>): ms-Protonen bei  $\delta$ : 8,39 8,58 9,23 9,37Octaäthyl-geminiporphyrin-diketon V  $C_{36}H_{46}N_4O_2$ , gef. 566Elektronenspektrum (CHCl<sub>3</sub>): 488 m $\mu$ ; 516 m $\mu$ ; 615 m $\mu$ ; 642 m $\mu$ ; 673 m $\mu$ .NMR-Spektrum (CDCl<sub>3</sub>): ms-Protonen bei  $\delta$ : 8,78 8,78 9,59 9,59Octaäthyl-geminiporphyrin-diketon VI  $C_{36}H_{46}N_4O_2$ , gef. 566Elektronenspektrum (CHCl<sub>3</sub>): 409 m $\mu$ ; 483 m $\mu$ ; 510 m $\mu$ ; 548 m $\mu$ ; 624 m $\mu$ ; 656 m $\mu$ ; 696 m $\mu$ .NMR-Spektrum (CDCl<sub>3</sub>): ms-Protonen bei  $\delta$ : 9,05 9,05 9,71 9,71Octaäthyl-geminiporphyrin-triketon VIII  $C_{36}H_{46}N_4O_3$ , gef. 582Elektronenspektrum (CHCl<sub>3</sub>): 401 m $\mu$ ; 599 m $\mu$ ; 690 m $\mu$ .NMR-Spektrum (CDCl<sub>3</sub>): ms-Protonen bei  $\delta$ : 7,78 8,01 8,08 8,90

## LITERATUR

- 1) z. B. H. Fischer und H. Eckhold, Liebigs Ann. Chem. 544, 138 (1940).
- 2) G. Klotmann, Dissertation, Braunschweig (1964).
- 3) R. Bonnett, D. Dolphin, A. W. Johnson, D. Oldfield und G. F. Stephenson, Proc. Chem. Soc., 371 (1964).